April 21, 1936. C. E. BEACH ET AL 2,038,405

ELECTRIC SWITCH

Filed Jan. 22, 1934 3 Sheets-Sheet 1

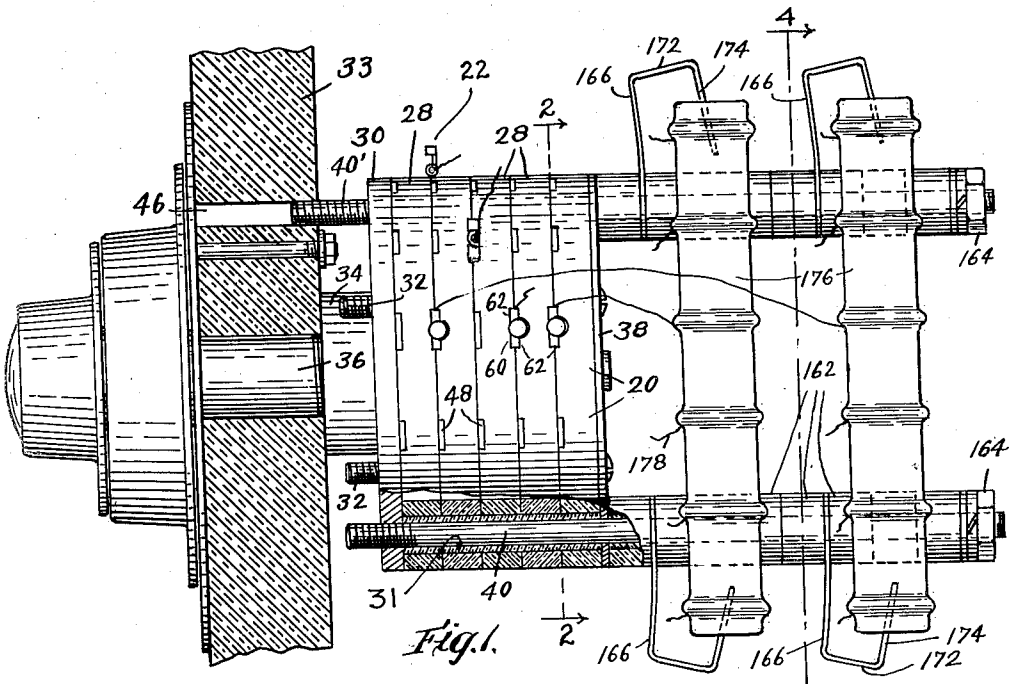


Fig. 1.

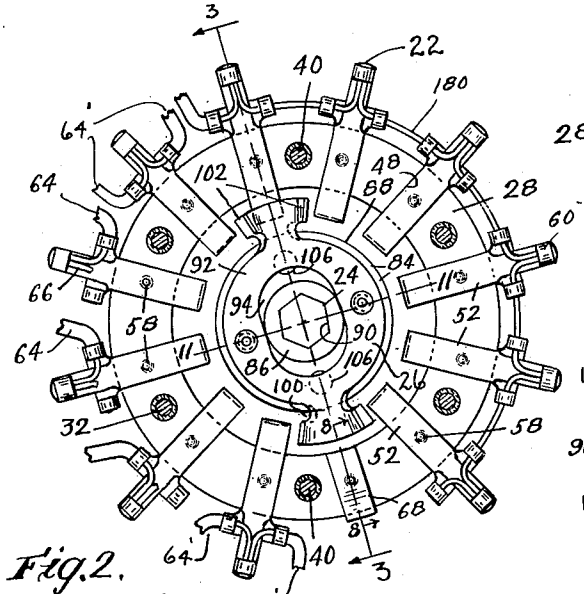


Fig. 2.

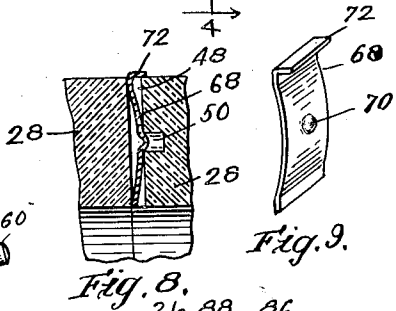


Fig. 8. Fig. 9.

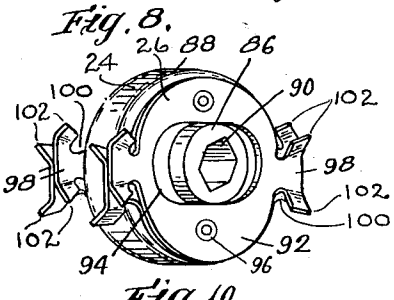


Fig. 10.

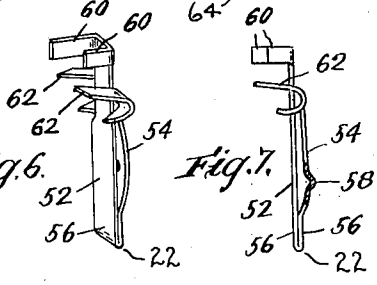


Fig. 6.

Fig. 7.

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ELECTRIC SWITCH

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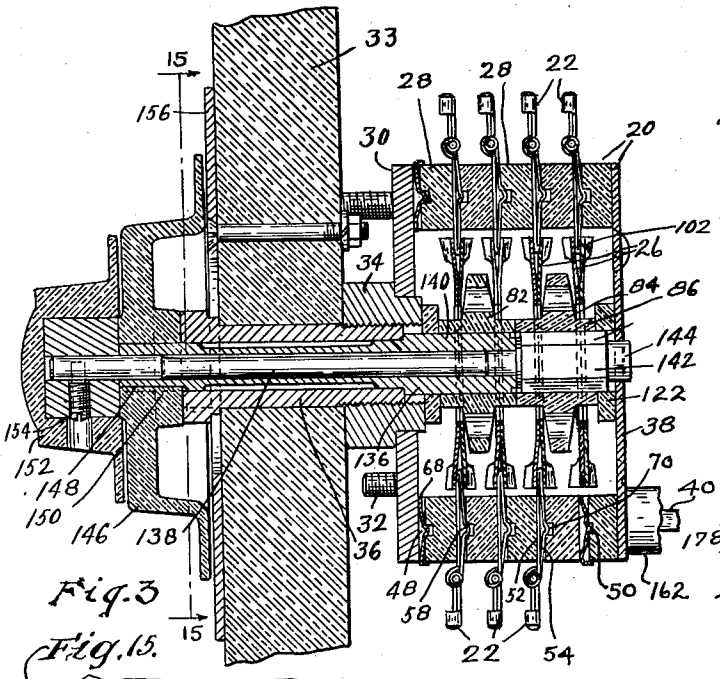


Fig. 3

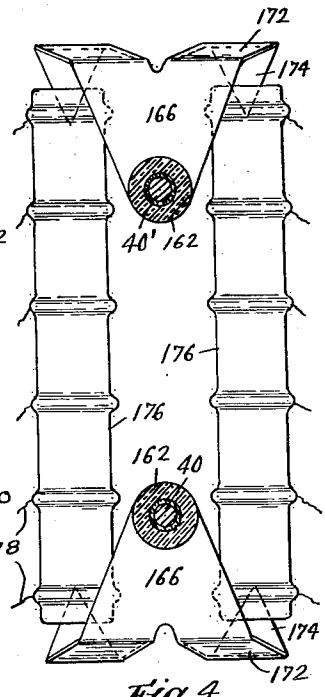
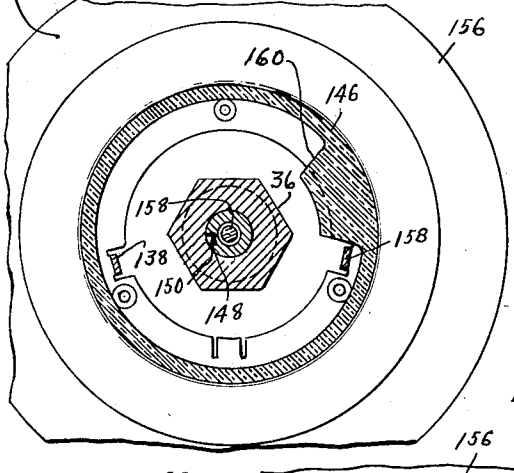


Fig. 4.

Fig. 15.



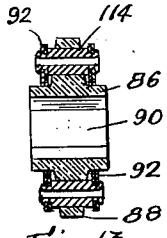


Fig. 13

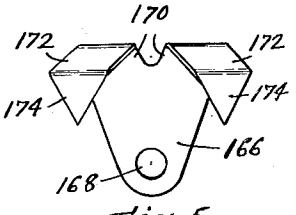


Fig. 5.

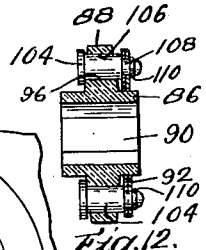


Fig. 12.

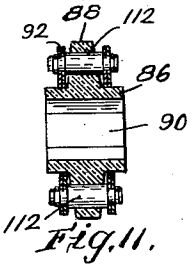


Fig. 11.

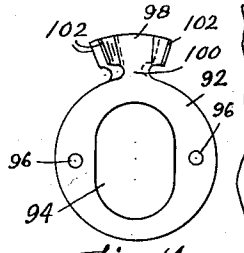


Fig. 14.

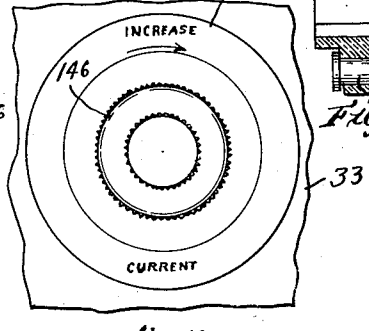


Fig. 16.

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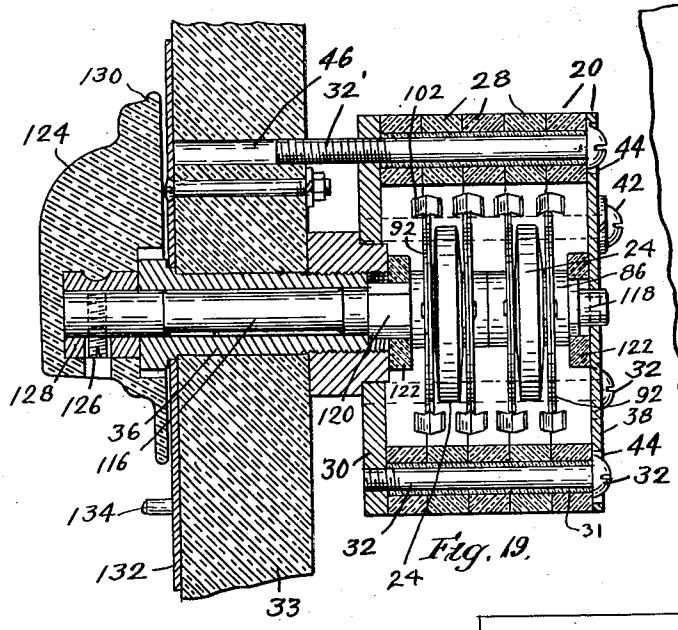


Fig. 19.

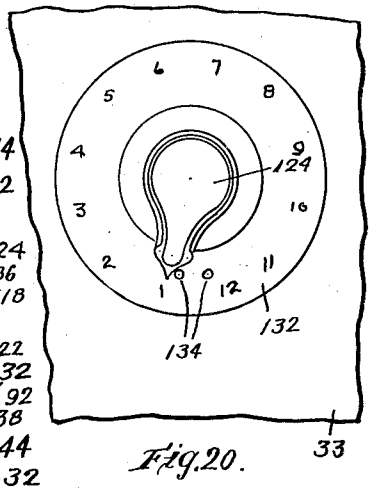


Fig. 20.

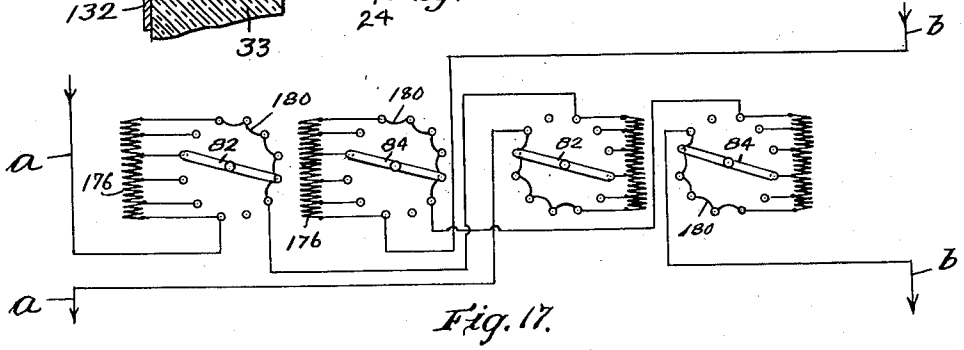


Fig. 17.

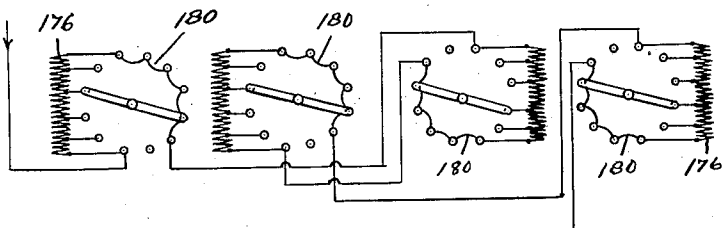


Fig. 18.

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UNITED STATES PATENT OFFICE

2,038,405

ELECTRIC SWITCH

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Application January 22, 1934, Serial No. 707,638

34 Claims. (Cl. 200—15)

This invention relates to electric switches of the rotary blade, multiple contact type, especially adapted for the control of multiple circuits either conjointly, in successive order, or in selected groups, as may be desired.

The switch is particularly intended for the control of fire alarm and similar and associated circuits where reliability of circuit control is imperative, irrespective of the frequency, or infrequency, of operation of the switch.

Hence one of the objects of the present invention is the provision of a multiple circuit switch having an improved construction for enclosing the operating mechanism and contact surfaces so as to protect the cooperating parts against mechanical injury and to exclude foreign matter such as dust, insects and the like from access thereto.

A further object is an improved form of stationary contact member that is a continuous metal member free from joints from its contact surface to its electrical connection with the circuit conductor and has provision for a mechanically secure electrical connection with the conductor independently of the use of solder and preferably has provision for a separate soldered connection with the conductor so as to insure a permanently maintained positive electrical connection between the conductor and the contact member.

It is also an object to provide the contact member with means which mechanically grips and supports the conductor about the insulation thereof to relieve the metal conductor from direct strain and thus reduce the liability of the conductor to break.

It is a still further object to provide, in a contact member having the foregoing characteristics, such formation and arrangement that permanency of electrical connection may be insured by immersing in molten solder that portion of the contact member which mechanically grips the circuit conductor or conductors without thereby immersing in or bringing into contact with the molten solder either the portion of the contact member which engages the conductor insulation for support thereof or the contact surface of said member.

Another object is the provision of a multiple conductor switch having a stationary contact member assembly, or stator, comprising any desired number of juxtaposed insulating rings clamped in axial alignment and each having closely circumferentially spaced radial slots in one of their radial faces that provide passages adapted to receive and retain the stationary contact members, the contact members being identical and each being so arranged that it is retained in its passage without the use of attaching screws or the like.

For some purposes the switch stator may be provided with more contact member receiving passages than there are contact members and it is an object of this invention to provide means which removably occupy the excess passages to exclude the passage of foreign matter therethrough into the interior of the switch.

A further object is the provision of a switch of the type described wherein the movable contact or bridging members are carried by insulating rotors and are so arranged that the plural bridging members of a rotor can be electrically connected or insulated, as may be desired for circuit control, the rotors being mounted on the same or different operating spindles so that all rotors can be rotated in unison or selected rotors can be rotated independently.

For many uses of such switches, it is desirable that means be provided whereby external indication will be given of the positioning of the movable or rotor contact with relation to the stator contacts; as by keying, or otherwise firmly securing against relative rotation, an external pointer and the internal rotors on a spindle or shaft, and providing suitable indicia along the path of the pointer. With such an arrangement, if there are two or some even number of such indicia, it is desirable, in the interest of symmetrical appearance, that the various parts shall be so assembled that, when the pointer is in vertical position, the rotor contacts shall be midway between their full connecting positions with relation to adjacent stator contacts, in order that the indicia for such positions shall be situated equidistant at respective sides of such vertical position of the pointer. However, if there are three, or some odd number of such indicia, it is correspondingly desirable that the parts shall be so assembled that when the pointer is in a vertical position the rotor contacts will occupy a full contacting position with relation to stator contacts. On the other hand, it is desirable that when a group of such switches are to be mounted upon a single panel, or upon a group of associated panels, it shall be unnecessary to rotatively differentiate between the stator structure positioning of switches having rotor contacts in full contacting positions from those having such contacts in intermediate position, when the pointer is vertically positioned.

It is therefore another object to provide rotor structure formed for association with the spindle in alternative positions whereby, for a given positioning of the shaft, (and hence, of a pointer fixed thereon) rotor contacts may be brought into full engagement with stator contacts or midway between two such contacts.

The switch of the present invention is intended for back-of-board or panel mounting and is so arranged that the operating members at the front of the board or panel are excluded or insulated from any current carrying path.

One of the purposes of the present switch is for the resistance control of circuits and an object of this invention is the provision of a switch having a mounting for the resistors, with the switch so arranged that one section thereof can introduce resistance in and remove it in fine steps simultaneously from both conductors of a circuit and another section thereof can introduce resistance in and remove it in coarse steps similarly from both conductors of the circuit.

Another object is generally to improve the construction and operation of multiple conductor switches.

Other objects of this invention, and the features of construction by which they are attained, will be pointed out hereinafter in connection with the description of the illustrated embodiments of the invention.

Like reference characters denote the same parts throughout the various views of the accompanying drawings, in which

Figure 1 is a side elevation partly in section of a multiple conductor switch embodying the present invention;

Fig. 2 is a section taken along line **2—2** of Fig. 1;

Fig. 3 is a sectional view of the switch of Figs. 1 and 2 taken along line **3—3** of Fig. 2;

Fig. 4 is a section taken along line **4—4** of Fig. 1 and illustrating particularly a group of resistors and the mounting therefor;

Fig. 5 is a detail of a resistor mounting;

Fig. 6 is a perspective view and Fig. 7 is a side elevation of a stationary contact member;

Fig. 8 is a sectional detail taken along line **8—8** of Fig. 2 and illustrating particularly a closure member for a contact passage of the stator;

Fig. 9 is a perspective view of the closure member of Fig. 8;

Fig. 10 is a perspective view of the rotor member of Fig. 2;

Fig. 11 is a sectional detail taken along line **11—11** of Fig. 2 and illustrating the manner of attaching a pair of bridging members in mutually insulated relation to the rotor member;

Fig. 12 is a sectional view similar to Fig. 11 but illustrating a manner of attaching a single bridging member to the rotor member;

Fig. 13 is a sectional view similar to Fig. 11 but illustrating the manner of electrically connecting the bridging members of and attaching them to the rotor member;

Fig. 14 is a plan view of a modified form of bridging member;

Fig. 15 is a section taken along line **15—15** of Fig. 3;

Fig. 16 is a front elevation of the dial plate and operating knobs of the switch of Fig. 3;

Figs. 17 and 18 are alternative arrangements of the switch and resistor connections of the switch of Fig. 1;

Fig. 19 is a sectional elevation of a single spindle switch constructed otherwise generally like the switch of Fig. 1; and

Fig. 20 is a front view of the dial plate and operating knob of the switch of Fig. 19.

The switch herein illustrated comprises a stator **20** in the form of an enclosing casing that carries the stationary contact members **22** and a rotor **24** that carries the movable contact or bridging members **26**. The stator comprises a series of stator rings **28**, as many as may be desired, composed of a suitable insulating material, as an artificial resin, disposed in juxtaposed concentric relation with the radial end faces of confronting rings in contact and with the end face of the innermost ring disposed against the flat face of a metal mounting plate or disc **30** which overlies and forms a closure for one end of the chamber within the rings. The rings are secured to said disc by screws **32**, which are passed loosely through the rings and are screw threaded into said mounting disc whereby to hold the disc and rings in the aforesaid relation. The screws are longer than are necessary for clamping purposes alone so that they can be backed off without becoming detached from the mounting disc, to thereby permit the axial separation of the stator rings for inserting the stationary contact members therebetween. Sleeves of insulating material **31**, may be provided over the screws for the purpose of increasing the electrical break down between such screws and current carrying parts.

The switch is adapted to be mounted on the back of a switchboard or panel **33** and the mounting disc has a hub **34**, herein illustrated as fixed in the disc, which bears against the rear face of the panel and holds the stator spaced therefrom. A bushing **36** is passed through the panel and is screw threaded into the hub and clamps the hub and hence the stator to the panel. The rear open end of the stator chamber is closed by a cover plate or disc **38** which is secured against the end stator ring by stud bolts **40**, in Fig. 1, and by screws **42**, in Fig. 19, the disc having apertures **44**, see especially Fig. 19, through which the heads of the ring clamping screws **32** can pass freely, so that the cover disc can be removed without disturbing the ring assembly. In Fig. 1, the top stud **40'**, and in Fig. 19, the top screw **32'**, are longer than the others and are located in a passage **46** in the panel **33** for the purpose of holding the stator against rotation.

Each stator ring is provided with a number of radial slots or grooves **48** in one radial end face thereof, the rings being assembled with the slots all facing in one direction as toward the mounting disc so that the slotted face of one ring is in contact with the unslotted face of the immediately adjacent ring. Each slot in about the middle of the bottom face thereof has a depression **50** cooperating with a contact member or slot closure, as the case may be, to hold them in the slot. As here shown each stator ring has twelve slots each of which can receive a stationary contact member **22**, all of which contact members are identical.

Each stationary contact member, see especially Figs. 2, 6, and 7, is formed from a single metal sheet so that all its various parts are integral with each other and there is a complete absence of joints in the conducting path of the contact member from the conductor engaging part to the contact surface thereof. The contact member comprises two generally flat integral body members **52** and **54** wide enough to enter the slots **48**

in the stator rings comfortably and be retained therein against undue edgewise movement and long enough to project sufficiently into the stator chamber to be engaged by a bridging member, as illustrated in Fig. 2. The two body members are reflexed into engagement with each other at that portion adapted to be located within the chamber and the outer face **56** of each thereat is adapted to make independent contact with the bridging member of the rotor. Above the contact face, the member **54** is reflexed away from the other body member **52** so that the uncompressed thickness of the contact is greater than the depth of the ring slots **48**, whereby the contact members will be frictionally retained in the slots. Said member **54** is provided with a hump or conical projection **58** that is adapted to enter the depression **50** of the ring slot whereby to hold the contact member definitely in the ring slot when the rings are clamped together. The outer end of the member **52** is provided with a pair of laterally outstanding ears **60, 60**, that are adapted to be clamped about a conductor. The outer end of the member **54** is provided with sets of laterally outstanding ears **62, 62**, located on opposite sides of the member **52** and adapted to be clamped around the insulating covering or a conductor.

The manner of applying the ears **60, 60** and the ears **62, 62** to the end of a conductor or to the ends of two conductors is illustrated in Fig. 2. As there shown, the bare wire is firmly held by the ears **60, 60**, which are tightly clamped around it. Where there is but a single conductor **64** to be connected to a member **22**, the bare end of such conductor is doubled upon itself and the doubled sections are clamped between the ears **60, 60**. If two conductors are to be connected to a single member **22** (as in the instance of the conductors **64', 64'** of Fig. 2) the ends of such conductors are situated side by side between the ears **60, 60** of their associate member **22**, and said ears are tightly clamped around the ends, thereby holding them in firm mechanical engagement with one another and with said member. In instances where a number of the members **22** are interconnected by a continuous bare wire,—such wire passes from one member to another, being doubled upon itself and the doubled sections clamped between the ears **60, 60** of each of the members.

The ears **62** are formed around the insulating covering of the wire, thereby providing a firm support for the conductor so as to relieve it from strain and prevent crystallization of the wire firmly held between the ears **60, 60** and, by taking advantage of the comparatively large radius of the resilient support afforded by the rubber insulation of the conductor, avoiding short bends and crystallization at point of support which might otherwise result from vibrations. When two insulated conductors are connected to one of the members **22**, the insulation of one conductor is gripped by one set of the ears **62**, and that of the other conductor by the other set of such ears. Where but one wire is connected, the ears **62** of one of the sets are bent down upon themselves so as to avoid interference with adjacent members **22**. In order to facilitate the application of solder for insuring permanency of effective electrical connection between conductor wires and the members **22**, the ears **60, 60** are so situated with relation to the ears **62, 62**, that said ears **60, 60** and the wire ends clamped therebetween may be dipped into a receptacle containing molten solder without bringing the ears **62, 62** or the insulation clamped thereby into engagement with the molten solder.

The contact members are adapted to be placed in operative position in the stator by inserting them in the slots of the assembled stator and pushing them to their intended places; the compressibility of the contact member permitting this to be done. Pursuant to this practice, the stator can be assembled without the contact members, and the latter can be subsequently inserted. In the occasional instances in which several contact members are affixed to a common conductor before they are placed in the stator, it will be convenient to separate the stator rings somewhat to facilitate the insertion of such contact members as a group. When the contact members are in position the projection **58** thereof retains them against unintentional detachment from the stator.

A closure strip is provided for contact slots in the stator that are not occupied by contact members, so as to exclude entrance of foreign matter such as dirt, insects, and the like, into the interior of the stator where the presence of such foreign matter might seriously interfere with the reliable operation of the switch. The slot closure, see especially Figs. 2, 8, and 9, comprises a resilient strip **68** having a width about equal to the width of a slot **48** and adapted to be received therein. The strip is reflexed or bowed in the middle so as to bear frictionally against the bottom of the slot and also against the face of the adjacent ring and has a hump or conical projection **70** adapted to enter the slot recess **50** and hold the closure definitely within the slot. The strip at the top has an ear **72** that is bent at right angles with the body of the strip and is adapted closely to overlie the entrance of the slot and thus seal it in a sufficiently tight manner to exclude foreign matter. The slot closures can be inserted in the slots without requiring the separation of the stator rings. This also is or can be the case with the stationary contact members.

The rotor **24** carries the bridging members **26** that bridge and electrically connect selected stationary contact members **22**. A series of such rotors including as many as desired may be provided although but two are herein shown in Figs. 3 and 19. The rotor members are or can be identical. As shown in Fig. 10, each comprises a hub **86** and a radially outstanding flange **88** both integral and formed of a suitable insulating material, as a moulded artificial resin. The hub is provided axially with a passage **90** therethrough arranged to receive an operating spindle; the construction arrangement being such as to provide a driving connection between said rotor **24** and the intended spindle as, through the use of hexagonal contour of said passage **90** and of the co-engaging portion of its supporting spindle. The rotor member is adapted to carry either one or two sets of bridging members **26** as the circuit requirements may indicate.

The bridging member, see especially Figs. 2, 3, and 10 through 14, comprises two discoidal plates **92** of resilient material having registering openings **94** therein through which the hub of the rotor member projects. The plates are provided with diametrically opposed holes **96** through which rivets are passed to secure the plates to the rotor member in normal contact with each other. Each plate is provided with a contact member or blade **98** that is adapted to engage the stationary contact members. Such blade outstands beyond the

edge of the plate and is connected therewith by a neck 100 and is provided at its opposite ends with wings 102 that are inclined toward the outer face of the plate. The openings 94 are preferably elongated in the direction of the contact blades to give more uniform flexibility. The contact blades of the cooperating pair of plates confront and are normally maintained in contact with each other by the inherent resiliency of the plates. One blade preferably has a small angular lead over the other blade so that a stationary contact member can be engaged by one blade before its companion blade leaves the contact member in the next adjacent slot of the stator.

The stationary contact members are embraced between the blades which wipe over and make independent contact with the contact sections 56 of the body members 52 and 58 of the stationary contact members 22, and are pressed thereagainst by the inherent resiliency of the apertured plates 92, thereby insuring good electrical engagement between the stationary contact members and the bridging members. For some purposes each bridging member will have two diametrically opposed sets of contact blades as illustrated in Figs. 2 and 10, in which case each bridging plate makes an independent electrical connection between the contact members. For other purposes the bridging member may have but one set of contact blades as illustrated in Fig. 14. Where the bridging member has opposed contact blades, a rotor member, in some instances, may have but one bridging member in which event it can be secured to the rotor member, on one side of the flange 88 thereof by a pair of rivets 104, (see Fig. 12), fixed in diametrically opposed axially extended passages 106 in the flange and having reduced extensions 108 extended through the rivet holes 96 of the bridging member.

The rivets can be either of metal or of some insulating material, such as fibre or artificial resin, although as here shown they are fibre rivets and have spring lock rings 110 received in grooves in the extensions 108 thereof to retain the bridging members thereon. The rotor member also can carry two bridging members, as illustrated in Figs. 3, 10, and 13, on opposite sides of the flange 88 and secured to the rotor member by rivets 112, usually of fibre or other insulating material having reduced end extensions that carry the bridging members. The single contact type of bridging member illustrated in Fig. 14 is usually employed in pairs on a common rotor member and both are electrically connected through metal rivets 114, Fig. 13.

The flange 88 of the rotor member is provided with two sets of diametrically opposed rivet passages 106, see especially Fig. 2, which sets are right angularly disposed to each other, so that the contact blades of the pair of bridging members of a rotor member can be right angularly displaced, if desired, for some circuit control purposes.

In the switch of Fig. 19 both rotor members are carried by the same operating spindle, whereas, in the switch of Fig. 3 the rotor members are carried by independently rotatable spindles. In Fig. 19 the spindle 116 is journaled in the bushing 36 and also has a reduced rear extension 118 that is journaled in the rear cover plate or disc 38. The spindle within the stator casing, as here shown, is non-circular, having a hexagonal section 120, on which both rotors 24, 24 are disposed, the fit between the spindle and the rotors being such that the latter are restrained from any harmful amount of independent rotary movement while being free for a restricted amount of axial movement so that they can align themselves with the stationary contact members. Spacer discs 122 are disposed on the spindle between the rotors and the cover discs 30 and 38 to located the rotor members properly within the stator.

The end of the spindle projects forwardly of the panel 32 and has a knob 124 of insulating material secured thereto by a screw 126 which is screw threaded in the spindle and bears against the inner face of a metal insert 128 which receives the spindle and is moulded in the knob. The axis through the knob 124 and its pointer 130 is displaced from a center line through a pair of diametrically opposed corners of the hexagonal section of the spindle by one quarter of the angular spacing between two adjacent contact slots of the stator for reasons which will be hereinafter more fully explained. The knob overlies the outer end of the bushing 36 and the hexagonal section 120 overlies the inner end of the bushing so that undue axial movement of the spindle is prevented, irrespective of relatively small variations in the thickness of panel 33. The knob 124 has a pointer 130 which sweeps over a dial plate 132 secured to the front face of the panel under the knob to indicate the particular connections corresponding to the pointer position. When desirable, the dial plate may be provided with one or more forwardly directed stop pins, such as the pins 134, adapted to be engaged by the pointer to prevent the spindle from being rotated further than is intended in either direction.

In the switch of Fig. 3 the rotor members are independently rotatable, the rotor member 82 being carried by a spindle 136 and the rotor member 84 being carried by a separate spindle 138 which is journaled within and coaxially of the spindle 136, which latter is journaled in the bushing 36. The spindle 136 has a hexagonal part 140 located within the stator and on which the rotor member 82 is mounted. The spindle 138 has a hexagonal part 142 disposed at the end of the hexagonal part 140 and carrying the rotor member 84. Said spindle 138 also has a reduced extension 144 which is journaled in the cover plate 38.

The spindle 136 projects forwardly of the panel 32 and has a knob 146 thereon the hub of which has a key 148 located in a keyway 150 of the spindle, the keyway being in line with a corner of the hexagonal section 140 of the spindle. The spindle 138 extends forwardly beyond the spindle 136 and has a knob 152 thereon disposed in front of the knob 146 and secured to the spindle by a set screw 154. A dial plate 156 is secured to the front face of the panel and has an outwardly extended projection 158, see especially Fig. 15, that is alternately engageable with an internal lug 160 of the knob 146 in its rotation in opposite directions, to limit the extent of angular movement thereof.

The axis of the lug 160 is displaced from the diametrical line through the key 148 by an angle equal to one-quarter of the angular spacing between two adjacent contact slots in a stator ring. The center line through a pair of opposed rivet passages 106 in the rotor member 82 is displaced from the center line through a pair of diametrically opposed corners of the hexagonal section of the spindle by one-quarter the angular spacing between two adjacent contact slots of the stator.

For many uses of such switches, it is desirable that means be provided whereby external indication would be given of the positioning of the movable or rotor contact with relation to the stator contacts; as by keying, or otherwise firmly

securing against relative rotation, an external pointer and the internal rotors on a spindle or shaft, and providing suitable indicia along the path of the pointer.

With such an arrangement, if there are two or some even number of such indicia, it is desirable, in the interest of symmetrical appearance, that the various parts shall be so assembled that, when the pointer 130 of the hub 124, or an equivalent mark on the knob 146, is disposed along the vertical center line through the shaft, the rotor contacts shall be mid-way between the full contacting positions with relation to adjacent stator contacts, in order that equal numbers of such indicia shall be symmetrically disposed at respective sides of such center line. However, if there are three or some odd number of such indicia, it is correspondingly desirable that, when the pointer is disposed along the vertical center line, the rotor contacts shall be in full contacting position with relation to stator contacts, in order that the indicia of some one position may be situated on such center line, and equal numbers of other indicia situated at respective sides thereof. The change from one to the other desired result can be attained, with the described angular displacement of the rotor bridging members, by simply turning the rotor endwise on its spindle.

One use for the switch herein described is to control the resistance of a circuit by providing for insertion of resistance in and removal of resistance from the two sides of a circuit simultaneously by steps of coarse and also fine degree. The switch of Figs. 1, 2, and 3 is especially adapted for such service and the stator casing carries the resistors. The stud bolts 40, 40', see Figs. 1, 3, 4, and 5, are extended rearwardly of the stator and carry thereon a series of insulating spacer discs 162 that are clamped against each other and also against the end cover disc 38 by nuts 164, screw threaded on the ends of the stud bolts. Between certain spacer discs are located resistor mounting members 166, each stud bolt having two such members which are disposed in confronting relation with the corresponding mounting members of the other stud. Said mounting members are identical. Each comprises a resilient metal plate having a stud receiving hole 168 therein and a pair of diverged arms 170 formed with horizontal sections 172 and terminated in pointed end sections or prongs 174 which are generally parallel with and are spaced from the body of the plate. The prongs of the corresponding upper and lower plates of the two studs confront each other.

A tubular resistor element 176 of ordinary well known construction, comprising a tube or a cylinder having recessed ends and carrying resistance material, usually a resistance wire, and provided with a series of taps 178, is disposed removably between each pair of corresponding prongs, the prong arms being flexed outwardly to permit the entrance of the tubular element therebetween and resiliently engaging the elements with considerable pressure. Certain of the resistor elements may have greater resistance than others and may be disposed between one or the other mount, as may be best suited for the convenient connection of their taps to the circuit and to the stationary contact members of the switch.

Each resistor is provided with six taps 178 each of which is connected with a different consecutive one of the eleven consecutive stationary contact members of a stator ring, the remaining contact members of the ring being connected together and to one of the end taps of the resistor by a common conductor 180 as illustrated in Fig. 2 and in the circuit diagrams of Figs. 17 and 18. Each resistor is connected to the contacts of a different stator ring, the high resistance resistors being connected to the contacts associated with one rotor member and the low resistance resistors being connected to the contacts associated with the other rotor member. Hence the taps of both high resistance resistors can be changed simultaneously and independently of the changing of taps of the low resistance resistors which also can be changed simultaneously.

In Fig. 17 are shown the circuit connections wherein one high and one low resistance resistor and their respective switch elements are inserted in separate conductors *a* and *b* of a circuit to vary separately the resistance of both sides of the circuit in coarse or in fine steps. In Fig. 18 all resistor elements are inserted in series in the same conductor to vary the resistance separately in fine or coarse steps.

Figs. 17 and 18 merely illustrate two of a large number of possible uses for the switch of the present invention in controlling multiple conductor circuits.

It will be understood by those skilled in this art that still other changes in number, form and arrangement of parts might be made without departing from the spirit of this invention; it should therefore be understood that the language used in the following claims is intended to cover all of the generic and specific features of the invention herein described and all statements of the scope of the invention, which, as a matter of language, might be said to fall therebetween.

We claim:

1. A multiple conductor electric switch comprising a stator casing having a peripheral wall formed with contact member receiving slots, a rotor rotatably disposed within said casing and carrying a contact bridging member, said stator having said slots distributed around said rotor for holding stationary contact members in position for engagement by said bridging member, and stationary contact members situated in respective ones of said stator slots, each contact member having a conductor engaging portion exteriorly of said casing, a portion for engagement by said bridging member interiorly of said casing and a portion intermediate said two first named portions and integral therewith, said contact members further being of such size and contour that said second and third named portions thereof are insertable from the exterior through said slots so as to bring said second named portions into operative position in said stator, and said third named portions involving means for retentatively engaging walls of said slots.

2. A multiple conductor electric switch comprising, in combination, a stator having an annular wall provided with a plurality of identically formed contact member receiving slots therethrough, a rotor rotatable within said stator and carrying a contact bridging member, stationary contact members associated with certain of said slots and each having a portion for engagement by said bridging member and situated within said stator and a second portion integral with said first named portion and situated within an associated one of said slots, said portions of such size and contour as to facilitate passage of said first named portion from the exterior of said stator through any one of said slots and

each contact member comprising means for removably retaining said second portion in any one of said slots, and closure members removably retained in slots unoccupied by said contacts.

3. A multiple conductor electric switch comprising a stator having a series of juxtaposed concentric identical insulating rings which have circumferentially spaced radial slots in one of their radial end faces, which slots extend entirely across said rings and are traversed by the unslotted radial faces of the immediately adjacent rings, means for securing said rings in the aforesaid relation and also with the corresponding slots of all rings in axial alignment, stationary contact members associated with certain of said slots which are situated in axial alignment, said members having a contact face portion projecting interiorly of said rings, a second portion integral with said face portion and situated within one of said slots and a conductor engaging portion extending exteriorly of said ring, said face portion and said second portion of such size and contour as to facilitate passage of said face portion from the exterior of said rings through any one of said slots and each contact member comprising means for removably retaining said second portion thereof in any one of said slots, and a rotor carrying a bridging member disposed within said rings and rotatable for effecting interconnections between said contact members.

4. A multiple conductor electric switch comprising a mounting plate, a series of juxtaposed concentric insulating rings bearing against one face of said plate, attaching screws passed through said rings and into said plate for securing said rings in the aforesaid relation, a cover plate overlying the open end of said series of rings and seated upon the outermost ring, screws independent of the aforesaid screws for clamping said cover plate to said ring, stationary contact members retained between said rings, said members having conductor engaging portions exteriorly of said rings and contact faces interiorly of said rings, and a rotor rotatable within said rings having a bridging member engageable with said contact faces.

5. A multiple conductor electric switch comprising a mounting plate, a series of juxtaposed concentric insulating rings bearing against one face of said plate, means securing said rings removably in the aforesaid relation, a cover plate overlying the end of said series of rings and bearing against the outermost ring, means securing said cover plate to said mounting plate, said insulating rings each having a plurality of circumferentially spaced radial slots in one radial face thereof, which slots are traversed by the unslotted face of the confronting ring, contact members retained in certain of said slots, said members having conductor engaging portions exteriorly of said rings and contact faces interiorly of said rings, a rotor rotatably disposed within said series of rings having a bridging member engageable with said contact faces, and slot closure members retained in slots unoccupied by said contact members.

6. The combination of a mounting panel and a multiple conductor electric switch carried thereby, said switch comprising a stator located at the rear of said panel, said stator having internal and external surfaces and a plurality of contact members provided with contact faces disposed internally of the stator and conductor engaging portions externally of the stator, a bushing extending through said panel and securing said stator thereto, an operating spindle journaled in said bushing and having an operating knob rotatable over the front of said panel, and a rotor carried by said spindle within said stator and having a bridging member engageable with the contact faces of said contact members, said stator having a projection in cooperative relationship with said panel for preventing rotary movement between said stator and said panel.

7. A multiple conductor electric switch comprising a stator having a peripheral wall formed with contact member receiving slots therethrough and contact members retained in said slots, said contact members having opposed resilient outwardly divergent body members compressed inwardly by and in frictional engagement with the opposite walls of said slots, said body members being integral and having parts disposed internally of said stator wall that are reflexed into contact, and a rotor rotatably disposed within said wall having a bridging member engageable with the contacting portions of said body members.

8. A multiple conductor electric switch comprising a stator having a series of juxtaposed concentric insulating rings, a mounting plate located at one end of and engaged by said series of rings, clamping screws extending through said rings and screw threaded into said mounting plate, said rings having radial slots in their radial end walls that are traversed by unslotted faces of confronting rings, and contact members disposed in said slots having compressible parts that are compressed between said rings and are thereby retained in said slots.

9. A multiple conductor electric switch comprising a stator having a series of juxtaposed concentric insulating rings, a mounting plate located at one end of and engaged by said series of rings, clamping screws extending through said rings and screw threaded into said mounting plate, said rings having radial recessed slots in their radial end walls that are traversed by unslotted faces of confronting rings, and contact members disposed in said slots having compressible parts that are compressed between said rings and are thereby retained in said slots, one of said compressible parts of a contact member having an outstanding projection which is located in the recess of said slot by which said contact member is definitely retained therein.

10. A contact member for an electric switch having a contact face at one end and having dual conducting clamping means at the other end, said dual clamping means being spaced apart and adapted to clamp about different portions of an intended conductor, and said contact member being integral throughout.

11. A contact member for an electric switch comprising a conductor strip having a contact face at one end, dual conductor clamping means at the other end, an insulated conductor disposed with its insulated portion engaged and clamped by one clamping means and having its exposed conducting wire engaged and clamped by said other clamping means, said contact member being integral throughout.

12. A contact member for an electric switch comprising a conducting strip reflexed approximately upon itself and thereby providing two body portions having free ends at the same end of said contact member, said contact member at the reflexed portion thereof providing a contact

face, and the free ends of both body portions having conductor clamping means.

13. A contact member for an electric switch comprising a conducting strip reflexed approximately upon itself and thereby providing two body portions having free ends at the same end of said contact member, said contact member at the reflexed portion thereof providing a contact face, the free end of one body portion having a single conductor-clamping means and the free end of the other body portion having dual clamping means.

14. A contact member for an electric switch comprising a conducting strip reflexed approximately upon itself and thereby providing two body portions having free ends at the same end of said contact member, said contact member at the reflexed portion thereof providing a contact face, the free end of one body portion having a single conductor-clamping means and the free end of the other body portion having dual clamping means, and a conductor extended in succession from one of said dual clamping means to the clamping means of said other body portion and thence to the other of said dual clamping means.

15. A contact member for an electric switch comprising two resilient body members integrally connected together at one end of the contact member and normally maintained in spaced apart generally parallel relation by their inherent resiliency, both free ends of said body members having conductor clamping means.

16. A contact member for an electric switch comprising two resilient body members integrally connected together at one end of the contact member and normally maintained in spaced apart generally parallel relation by their inherent resiliency, the free ends of at least one of said body members having conductor clamping means, and one of said body members having an outstanding support engaging projection.

17. An electric switch including the combination of a stationary contact member comprising an integral conducting strip reflexed to provide two generally parallel body members, the free ends of both body members having conductor engaging means, and a movable contact member cooperating with said stationary contact member and comprising a pair of superposed contact plates between which the reflexed end of said stationary contact member is adapted to be disposed, each plate making contact with a separate body member.

18. In a rotary electric switch, a rotor member comprising a hub having an outstanding flange, a contact member carried by said rotor comprising a pair of contact discs confronting one face of said flange and having registering apertures in the middle thereof through which said hub is extended and peripherally disposed confronting contact blades, and means carried by said flange connecting said discs thereto on opposite sides of the rotor axis.

19. An electric switch comprising an enclosing casing having contact member receiving slots extended through a wall thereof, contact members extended through certain of said slots, and a slot closure member for closing a slot not occupied by a contact member, said closure member comprising a resilient bowed plate which is located within and frictionally engages opposite walls of said slot and has a reflexed outer end which overlies the entrance to said slot.

20. An electric switch comprising an enclosing casing having recessed contact member receiving slots extended through a wall thereof, contact members extended through certain of said slots, and a slot closure member for closing a slot not occupied by a contact member, said closure member comprising a resilient bowed plate which is located within and frictionally engages opposite walls of said slot and has a reflexed outer end which overlies the entrance to said slot, said plate having a plate retaining projection which enters the recess in said slot.

21. A rotary electric switch comprising a stator casing, stationary contact members carried thereby, a supporting bushing for said casing, an operating spindle journaled therein having a polygonal section located within said casing, and a rotor member having a corresponding polygonal passage therethrough received slidably on said polygonal section and having bridging members cooperating with said stationary contact members.

22. In a rotary electric switch, a casing having equi-angularly circumferentially spaced contact members, an operating spindle having an indicator moving therewith in fixed relation thereto, a rotor member removably received on that end of said spindle within said casing and having a keyed driving connection therewith in each of two positions of said rotor member on said spindle that are endwise reversed and 180° apart, and a bridging member carried by said rotor member having a contact blade cooperating with said stationary contact members, the axis of said contact blades being angularly displaced from the axis of said indicator by one-half of the angular spacing of said contact members whereby for the same selected position of said indicator said contact blades will be between two contact members in one position of the rotor member on the spindle and will engage one or another of said contact members in the opposite position of the rotor member on the spindle.

23. In an electric switch comprising a stator having a mounting plate, a series of juxtaposed concentric insulating rings on said plate, a plurality of stationary contact members carried by said rings, a rotor within said casing having a bridging member engageable with said contact members, parallel studs extended through said rings and screw-threaded in said mounting plate, means on said studs for clamping said rings upon said mounting plate, said studs being extended rearwardly of said series of rings, and resilient resistor mounts carried by said stud-extensions.

24. An electric switch comprising a stator having a mounting plate, a bushing carried by and extending forwardly of said mounting plate, a series of juxtaposed confronting insulating rings carried by said mounting plate concentrically with said bushing, attaching screws passed through said rings and screw threaded into said mounting plate, stationary contacts carried by said rings, an operating spindle journaled in said bushing, a rotor member carried by said spindle within said rings and having a bridging member cooperating with said stationary contact members, a cover plate overlying the open ends of said rings, a pair of studs passed through said cover plate and screw threaded into said mounting plate and extended rearwardly of said cover plate, and clamping means on said studs securing said plate in the aforesaid relation.

25. In a rotary electric switch, stationary contacts, an operating spindle, a rotor member carried by said spindle and having a keyed driving connection therewith, and movable contacts car-

ried by said rotor member for cooperation with said stationary contacts, the axis of said movable contacts being angularly displaced from the axis of said keyed connection and said member being reversible endwise on said spindle, whereby for a given setting of said spindle, said movable contacts will be in engagement with said stationary contacts in one position and will be out of engagement therewith in reversed position.

26. In a rotary electric switch, stationary contacts, an operating spindle involving an indicator moving therewith in fixed relation thereto, a rotor member carried by said spindle and having a keyed driving connection therewith, and movable contacts carried by said rotor member for cooperation with said stationary contacts, the axis of said movable contacts being angularly displaced from the axis of said keyed connection and said member being reversible endwise on said spindle, whereby for a selected setting of said indicator, said movable contacts will be in engagement with said stationary contacts in one position and will be out of engagement therewith in reversed position.

27. In a rotary electric switch, an operating spindle, two stationary contacts located at opposite sides thereof, a rotor member carried by and endwise reversible on said spindle, said member having a driving connection therewith, and bridging members carried by said rotor member for establishing a connection between said contacts, whereby, for a selected setting of said spindle, said bridging members will engage said stationary contacts when said rotor member is in one position on said spindle and will be out of engagement with said contacts when said rotor member is in the reversed position.

28. In a rotary electric switch, an operating spindle involving an indicator moving therewith in fixed relation thereto, two stationary contacts located at opposite sides of said spindles, a rotor member carried by and endwise reversible on said spindle, said member having a driving connection therewith, and bridging members carried by said rotor member for establishing a connection between said contacts, whereby, for a selected setting of said indicator, said bridging members will engage said stationary contacts when said rotor member is in one position on said spindle and will be out of engagement with said contacts when said rotor member is in the reversed position.

29. In a rotary electric switch, a stationary contact, an operating spindle, and a rotor member carried by said spindle in driving relationship therewith and having configuration for determining angular relationship between said spindle and intended movable contacts when applied to said member, whereby for a selected positioning of said spindle and assembly of said rotor member thereon, a suitable movable contact assembled on said spindle in an intended manner will engage said stationary contact, and whereby endwise reversal of relationship between said rotor member and said spindle will result in angular displacement of such movable contact, when correspondingly mounted upon said rotor member, that it will be out of engagement with said stationary contact.

30. In a rotary electric switch, a stationary contact, an operating spindle involving an indicator moving therewith in fixed relation thereto, and a rotor member carried by said spindle in driving relationship therewith and having configuration for determining angular relationship between said spindle and intended movable contacts when applied to said member, whereby for a selected positioning of said indicator and assembly of said rotor member on said spindle, a suitable movable contact assembled on said member in an intended manner will engage said stationary contact, and whereby endwise reversal of relationship between said rotor member and said spindle will result in angular displacement of such movable contact, when correspondingly mounted upon said rotor member, that it will be out of engagement with said stationary contact.

31. In a rotary electric switch, stationary contacts, an operating spindle involving an indicator moving therewith in fixed relation thereto, a rotor member carried by said spindle and having a keyed driving connection therewith, and movable contacts carried by said rotor member for cooperation with said stationary contacts, the axis of said movable contacts being angularly displaced from the axis of said keyed connection and said member being reversible endwise on said spindle, whereby for a selected setting of said indicator, said movable contacts will be in central engagement with certain of said stationary contacts in one position and will be positioned substantially mid-way btween said contacts in reversed position.

32. An electric switch comprising a stator having a mounting plate, a bushing carried by and extending forwardly of said mounting plate, a series af juxtaposed confronting insulating rings carried by said mounting plate concentrically with said bushing, attaching screws passing through said rings and secured to said mounting plate, stationary contacts carried by said rings, a cover plate overlying the open ends of said rings, a pair of studs secured to said mounting plate and passing through and extending rearwardly of said cover plate, clamping means on said studs for securing said cover plate in the aforesaid relation, an operating spindle journaled in said bushing, a second operating spindle journaled in said first named spindle, each of said spindles having axially aligned rotor carrying sections located within said rings, and a rotor member removably positioned on each of said sections and each having contact bridging members positioned for independent engagement with said contacts responsive to actuation of respective ones of said spindles.

33. An electric switch comprising a stator having a mounting plate, a bushing carried by and extending forwardly of said mounting plate, a series of juxtaposed confronting insulating rings carried by said mounting plate concentrically with said bushing, attaching screws passing through said rings and secured to said mounting plate, stationary contacts carried by said rings, an operating spindle journaled in said bushing, a second operating spindle journaled in said first named spindle, each of said spindles having axially aligned rotor carrying sections located within said rings, and a rotor member removably positioned on each of said sections and each having contact bridging members positioned for independent engagement with said contacts responsive to actuation of respective ones of said spindles.

34. In a multiple conductor rotary electric switch, a stator casing, an insulating rotor member rotatably mounted within said casing, a contact member carried by said rotor member, said contact member comprising a pair of discoidal plates of resilient conducting material, each having peripherally disposed cooperating confront-

ing contact blades, and a plurality of stationary contacts carried by said casing in suitable cooperative relationship with the contact blade of said rotor contact member, said plates being secured to said rotor in such relative positions that the contact blade of one plate will have a lead over the contact blade of the other plate, whereby when said rotor carried contact member is positioned midway between adjacent ones of said stationary contacts, said confronting blades will engage respective ones of said adjacent contacts.

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